

AMENDMENTS TO THE CLAIMS

1-34. (canceled)

35. (currently amended) Apparatus for treating a condition of a subject, comprising:

~~[[an]]~~ a plurality of electrode devices, configured to be coupled to respective longitudinal sites of longitudinal nervous tissue of the subject having first and second types of nerve fibers, through which body-generated action potentials propagate at first and second velocities, respectively, wherein two of the plurality of electrode devices are configured to be coupled at adjacent ones of the longitudinal sites that are separated by at least 2 mm; and

a control unit, configured ~~to~~ to:

sequentially drive the electrode devices to apply to the nervous tissue [[a]] respective currents, with delays between driving each of the electrode devices that are timed to the first velocity of the propagation of the body-generated action potentials so as to minimize undesired blocking of the body-generated action potentials propagating through the first type of nerve fibers, which is capable of

configure the currents to induce inducing respective first orthodromic electrode-generated action potentials that propagate in the nervous tissue in a first direction, so as to treat the condition, and

configure the currents configured to suppress respective second electrode-generated action potentials from propagating in the nervous tissue in a second direction opposite to the first direction,

~~wherein the control unit is configured to~~ repeatedly,
during a series of temporally non-contiguous periods,
induce the first orthodromic electrode-generated
action potentials and suppress the second electrode-
generated action potentials, and

~~wherein the control unit is configured to~~
substantially withhold, during respective times
between the non-contiguous periods, the inducing of
the first orthodromic electrode-generated action
potentials and the suppressing of the second
electrode-generated action potentials.

36. (currently amended) Apparatus according to claim 35,
wherein the control unit is configured to drive the
electrode devices to configure the currents to induce the
first orthodromic electrode-generated action potentials to
propagate in the nervous tissue in an afferent direction
with respect to a central nervous system of the subject, so
as to treat the condition.

37. (currently amended) Apparatus according to claim 35,
wherein the control unit is configured to drive the
electrode devices to configure the currents to induce the
first orthodromic electrode-generated action potentials to
propagate in the nervous tissue in an efferent direction
with respect to a central nervous system of the subject, so
as to treat the condition.

38. (currently amended) Apparatus according to claim 36,
wherein the longitudinal tissue includes a vagus nerve of

the subject, and wherein the electrode devices are ~~[[is]]~~ configured to be coupled to the vagus nerve of the subject.

39. (currently amended) Apparatus according to claim 35, wherein the control unit is configured to: (a) drive the electrode devices to apply the currents_u, and (b) suppress the second electrode-generated action potentials, at substantially the same time.
40. (currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents_u to be capable of treating an involuntary movement disorder of the subject.
41. (currently amended) Apparatus according to claim 35, wherein the control unit is configured to regulate the suppressing of the second electrode-generated action potentials so as to inhibit an undesired response of a central nervous system of the subject generated responsive to the electrode devices applying the currents_u to the nervous tissue.
42. (currently amended) Apparatus according to claim 35, wherein the control unit is configured to regulate the suppressing of the second electrode-generated action potentials so as to inhibit an undesired sensation generated responsive to the electrode devices applying the currents_u to the nervous tissue.

43. (currently amended) Apparatus according to claim 35, wherein the control unit is configured to regulate the suppressing of the second electrode-generated action potentials so as to suppress second action potentials induced responsive to the electrode devices applying the currents.
44. (withdrawn-currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating a sleep disorder of the subject.
45. (withdrawn-currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating a gastrointestinal motility disorder of the subject.
46. (withdrawn-currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating an eating disorder of the subject.
47. (withdrawn-currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating obesity of the subject.

48. (withdrawn—currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating anorexia of the subject.
49. (withdrawn—currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating a gastrointestinal tract disorder of the subject.
50. (withdrawn—currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating hypertension of the subject.
51. (withdrawn—currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating coma of the subject.
52. (currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating epilepsy of the subject.
53. (currently amended) Apparatus according to claim 35, wherein the longitudinal tissue includes a vagus nerve of the subject, and wherein the electrode devices are [[is]]

configured to be coupled to the vagus nerve of the subject, and wherein the control unit is configured to: (a) configure the currents so as to be capable of treating epilepsy of the subject, and (b) suppress second electrode-generated action potentials that interfere with an ability of the subject to speak.

54. (withdrawn-currently amended) Apparatus according to claim 35, wherein the longitudinal tissue includes a vagus nerve of the subject, and wherein the electrode devices are configured ~~is adapted~~ to be coupled to the vagus nerve of the subject, and wherein the control unit is adapted to configure the currents so as to be capable of inducing constriction of a lower esophageal sphincter of the subject.

55. (canceled)

56. (currently amended) Apparatus according to claim 35, wherein the electrode devices are ~~is~~ configured to be coupled to longitudinal nervous tissue of a central nervous system of the subject.

57. (currently amended) Apparatus according to claim 35, wherein the electrode devices are ~~is~~ configured to be coupled to nervous tissue of a peripheral nervous system of the subject.

58-59. (canceled)

60. (currently amended) Apparatus according to claim 35, wherein the control unit is configured to regulate the suppressing of the second electrode-generated action potentials so as to inhibit an undesired effector action responsive to driving the electrode devices to apply the currents to the nervous tissue.
61. (withdrawn-currently amended) Apparatus according to claim 60, wherein the control unit is configured to suppress second electrode-generated action potentials that induce increased acid secretion in a gastrointestinal tract of the subject.
62. (withdrawn-currently amended) Apparatus according to claim 60, wherein the control unit is configured to suppress second electrode-generated action potentials that induce muscular contraction.
63. (currently amended) Apparatus according to claim 60, wherein the control unit is configured to suppress second electrode-generated action potentials that induce bradycardia.
64. (currently amended) Apparatus according to claim 35, wherein the control unit is configured to drive the electrode devices to apply [[an]] respective electric

fields to the nervous tissue configured to suppress the second electrode-generated action potentials.

65-67. (canceled)

68. (currently amended) Apparatus according to claim 35 [[65]], wherein two of the plurality of electrode devices are adapted to be coupled at adjacent ones of the sites that are separated by less than ~~about~~ 4 mm.

69. (currently amended) Apparatus according to claim 35, and comprising a sensor adapted to sense an indication of a presence of the condition and to generate a sensor signal responsive thereto, wherein the control unit is adapted to drive the electrode devices responsive to the sensor signal.

70. (currently amended) Apparatus according to claim 35, wherein the control unit is adapted to receive an input from the subject and to drive the electrode devices responsive to the input.

71-72. (canceled)

73. (previously presented) Apparatus according to claim 69, wherein the sensor is configured to sense the indication by sensing at least one physiological parameter of the subject

selected from the group consisting of:
electroencephalographic (EEG) waves, respiration changes,
heart rate changes, an aura, and a motor effect.

74. (withdrawn) Apparatus according to claim 69, wherein the condition includes a gastrointestinal motility disorder of the subject, and wherein the sensor is configured to sense the indication by sensing at least one physiological parameter of the subject selected from the group consisting of: a pattern of contractions of a portion of a gastrointestinal tract of the subject, and digestion by the subject.
75. (withdrawn) Apparatus according to claim 69, wherein the condition includes a sleep disorder of the subject, and wherein the sensor is configured to sense the indication by sensing at least one physiological parameter of the subject selected from the group consisting of: a respiration pattern of the subject indicative of wakefulness during normal nocturnal hours, abdominal impedance changes associated with respiration by the subject indicative of the sleep disorder, a sustained abnormal period of cessation of respiration of the subject, respiration typically associated with a state of sleeplessness of the subject, electroencephalographic (EEG) activity of the subject, a sudden uncontrolled nodding of the head of the subject, abdominal impedance of the subject, and eye movement of the subject.
76. (withdrawn) Apparatus according to claim 69, wherein the indication includes swallowing by the subject, and wherein

the sensor comprises one or more electrodes configured to be implanted in a vicinity of an esophagus of the subject, and to detect the swallowing.

77. (withdrawn) Apparatus according to claim 69, wherein the condition includes an eating disorder of the subject, and wherein the indication includes a quantity of food consumed by the subject in a predetermined period of time, and wherein the sensor is configured to sense the quantity.
78. (withdrawn) Apparatus according to claim 69, wherein the condition includes an eating disorder of the subject, and wherein the indication includes an amount of food in a stomach of the subject, and wherein the sensor comprises one or more electrodes configured to be secured to an outer wall of the stomach, and to sense the amount of the food in the stomach.
79. (previously presented) Apparatus according to claim 69, wherein the sensor is configured to sense the indication by sensing electroencephalographic (EEG) activity of the subject.
80. (previously presented) Apparatus according to claim 69, wherein the sensor is configured to sense the indication by sensing blood pressure of the subject.

81. (currently amended) Apparatus according to claim 37, wherein the longitudinal tissue includes a vagus nerve of the subject, and wherein the electrode devices are ~~[[is]]~~ configured to be coupled to the vagus nerve of the subject.
82. (withdrawn-currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating migraine headache of the subject.
83. (withdrawn-currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating depression of the subject.
84. (currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating tremor of the subject.
85. (currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the currents so as to be capable of treating Parkinson's disease of the subject.
86. (currently amended) Apparatus according to claim 35, wherein the control unit is adapted to configure the

currents so as to be capable of treating stroke of the subject.

87. (currently amended) Apparatus for treating a condition of a subject, comprising:

~~[[an]]~~ a plurality of electrode devices, configured to be coupled to respective longitudinal sites of longitudinal nervous tissue of the subject having first and second types of nerve fibers, through which body-generated action potentials propagate at first and second velocities, respectively;

a sensor, configured to sense an indication of a presence of the condition and to generate a sensor signal responsive thereto; and

a control unit, configured to receive the sensor signal, and, responsive thereto, ~~to~~ to:

sequentially drive the electrode devices to~~[[:]]~~ apply to the nervous tissue ~~[[a]]~~ respective currents, with delays between driving each of the electrode devices that are timed to the first velocity of the propagation of the body-generated action potentials so as to minimize undesired blocking of the body-generated action potentials propagating through the first type of the nerve fibers,

~~which is capable of inducing~~ configure the currents to induce respective first orthodromic electrode-generated action potentials that propagate in the nervous tissue in a first direction, so as to treat the condition, and

configure the currents to suppress respective second electrode-generated action potentials from propagating

in the nervous tissue in a second direction opposite the first direction.

88. (currently amended) Apparatus according to claim 87, wherein the control unit is configured to drive the electrode devices to configure the currents to induce the first orthodromic action potentials to propagate in the nervous tissue in an afferent direction with respect to a central nervous system of the subject, so as to treat the condition.
89. (currently amended) Apparatus according to claim 88, wherein the longitudinal tissue includes a vagus nerve of the subject, and wherein the electrode devices are ~~[[is]]~~ configured to be coupled to the vagus nerve.
90. (currently amended) Apparatus according to claim 87, wherein the control unit is configured to drive the electrode devices to configure the currents to induce the first electrode-generated orthodromic action potentials to propagate in the nervous tissue in an efferent direction with respect to a central nervous system of the subject, so as to treat the condition.
91. (currently amended) Apparatus according to claim 90, wherein the longitudinal tissue includes a vagus nerve of the subject, and wherein the electrode devices are ~~[[is]]~~ configured to be coupled to the vagus nerve.

92. (currently amended) Apparatus according to claim 87, wherein the control unit is configured to: (a) drive the electrode deviceses to apply the currentss, and (b) suppress the second electrode-generated action potentials, at substantially the same time.
93. (currently amended) Apparatus according to claim 87, wherein the control unit is configured to regulate the suppressing of the second electrode-generated action potentials so as to inhibit an undesired response of a central nervous system of the subject generated responsive to the electrode deviceses applying the currentss to the nervous tissue.
94. (currently amended) Apparatus according to claim 87, wherein the control unit is configured to regulate the suppressing of the second electrode-generated action potentials so as to inhibit an undesired sensation generated responsive to the electrode deviceses applying the currentss to the nervous tissue.
95. (currently amended) Apparatus according to claim 87, wherein the control unit is configured to regulate the suppressing of the second electrode-generated action potentials so as to suppress second electrode-generated action potentials induced responsive to the electrode device applying the currentss.

96. (withdrawn-currently amended) Apparatus according to claim 87, wherein the condition is selected from the group consisting of: a gastrointestinal motility disorder of the subject, an eating disorder of the subject, obesity of the subject, anorexia of the subject, a gastrointestinal tract disorder of the subject, hypertension of the subject, and coma of the subject, and wherein the control unit is configured to configure the currents so as to be capable of treating the selected condition.
97. (currently amended) Apparatus according to claim 87, wherein the condition is selected from the group consisting of: Parkinson's disease, and tremor, and wherein the control unit is configured to configure the currents so as to be capable of treating the selected condition.
98. (currently amended) Apparatus according to claim 87, wherein the longitudinal tissue includes a vagus nerve of the subject, wherein the electrode devices are [[is]] configured to be coupled to the vagus nerve, and wherein the control unit is configured to: (a) configure the currents so as to be capable of treating epilepsy of the subject, and (b) suppress second electrode-generated action potentials that interfere with an ability of the subject to speak.
99. (withdrawn-currently amended) Apparatus according to claim 87, wherein the longitudinal tissue includes a vagus nerve of the subject, wherein the electrode devices are [[is]] configured to be coupled to the vagus nerve, and wherein the control unit is configured to configure the currents so

as to be capable of inducing constriction of a lower esophageal sphincter of the subject.

100. (currently amended) Apparatus according to claim 87, wherein the longitudinal tissue is selected from the group consisting of: longitudinal nervous tissue of a central nervous system of the subject, and longitudinal nervous tissue of a peripheral nervous system of the subject, and wherein the electrode devices are ~~[[is]]~~ configured to be coupled to the selected tissue.
101. (currently amended) Apparatus according to claim 87, wherein the control unit is configured to regulate the suppressing of the second electrode-generated action potentials from propagating in the second direction so as to inhibit an undesired effector action responsive to driving the electrode devices to apply the currents to the nervous tissue.
102. (previously presented) Apparatus according to claim 87, wherein the sensor is configured to sense the indication by sensing at least one physiological parameter of the subject selected from the group consisting of: electroencephalographic (EEG) waves, respiration changes, heart rate changes, an aura, and a motor effect.
103. (withdrawn) Apparatus according to claim 87, wherein the condition includes a gastrointestinal motility disorder of the subject, and wherein the sensor is configured to sense

the indication by sensing at least one physiological parameter of the subject selected from the group consisting of: a pattern of contractions of a portion of a gastrointestinal tract of the subject, and digestion by the subject.

104. (withdrawn) Apparatus according to claim 87, wherein the condition includes a sleep disorder of the subject, and wherein the sensor is configured to sense the indication by sensing at least one physiological parameter of the subject selected from the group consisting of: a respiration pattern of the subject indicative of wakefulness during normal nocturnal hours, abdominal impedance changes associated with respiration by the subject indicative of the sleep disorder, a sustained abnormal period of cessation of respiration of the subject, respiration typically associated with a state of sleeplessness of the subject, electroencephalographic (EEG) activity of the subject, a sudden uncontrolled nodding of the head of the subject, abdominal impedance of the subject, and eye movement of the subject.

105. (withdrawn) Apparatus according to claim 87, wherein the indication includes swallowing by the subject, and wherein the sensor comprises one or more electrodes configured to be implanted in a vicinity of an esophagus of the subject, and to detect the swallowing.

106. (withdrawn) Apparatus according to claim 87, wherein the condition includes an eating disorder of the subject, and wherein the indication includes a quantity of food consumed

by the subject in a predetermined period of time, and wherein the sensor is configured to sense the quantity.

107. (withdrawn) Apparatus according to claim 87, wherein the condition includes an eating disorder of the subject, and wherein the indication includes an amount of food in a stomach of the subject, and wherein the sensor comprises one or more electrodes configured to be secured to an outer wall of the stomach, and to sense the amount of the food in the stomach.
108. (previously presented) Apparatus according to claim 87, wherein the sensor is configured to sense the indication by sensing blood pressure of the subject.
109. (currently amended) Apparatus according to claim 87, wherein the control unit is configured to drive the electrode devices to apply [[an]] respective electric fields to the nervous tissue configured to suppress the second electrode-generated action potentials.
110. (canceled)
111. (currently amended) A method for treating a condition of a subject, comprising:
 - identifying that the subject suffers from the condition; and

treating the condition by:

sequentially driving [[a]] currents into respective longitudinal sites of a vagus nerve longitudinal nervous tissue of the subject having a first set of fibers and a second set of fibers, through which first body-generated action potential propagate at a first velocity, and second body-generated action potentials propagate at a second velocity, respectively, the first set of fibers having diameters generally different from diameters of the second set of fibers, with delays between driving each of the currents that are timed to the first velocity so as to minimize undesired blocking of the first body-generated action potentials propagating through the first set of fibers;

configuring the currents to induce, ~~in the first set of fibers,~~ respective first orthodromic electrode-generated action potentials that propagate in the vagus nerve nervous tissue in a first direction, so as to treat the condition, ~~while substantially not inducing, in the second set of fibers,~~ action potentials that propagate in the first direction, and to suppressing respective second electrode-generated action potentials from propagating in the vagus nerve nervous tissue in a second direction opposite to the first direction.

112. (currently amended) A method according to claim 111, wherein configuring the currents comprises configuring the currents to induce the first orthodromic electrode-generated action potentials to propagate ~~in the first set of fibers~~ in an afferent direction with respect to a central nervous system of the subject.

113. (currently amended) A method according to claim 111, wherein configuring the currents comprises configuring the currents to induce the first orthodromic electrode-generated action potentials to propagate ~~in the first set of fibers~~ in an efferent direction with respect to a central nervous system of the subject.

114. (canceled)

115. (withdrawn) A method according to claim 111, wherein the condition is selected from the group consisting of: a gastrointestinal motility disorder of the subject, an eating disorder of the subject, obesity of the subject, anorexia of the subject, a gastrointestinal tract disorder of the subject, hypertension of the subject, and coma of the subject, and wherein identifying comprises identifying that the subject suffers from the selected condition.

116. (previously presented) A method according to claim 111, wherein suppressing the second action potentials comprises suppressing the second action potentials repeatedly, during a series of temporally non-contiguous action potential suppression periods, and wherein the method comprises substantially withholding the suppressing of the second action potentials between the action potential suppression periods.

Applicants: Ehud Cohen, et al.
Serial No.: 10/722,589
Filed: November 25, 2003
Page 47

117. (currently amended) A method according to claim 111, and comprising sensing an indication of a presence of the condition, wherein driving the currents_u comprises driving the currents_u responsive to sensing the indication.

118-119. (canceled)

120. (withdrawn) A method according to claim 111, wherein the condition is selected from the group consisting of: migraine headache, depression, and stroke, and wherein identifying comprises identifying that the subject suffers from the selected condition.

121-140. (canceled)